

Rektangles

Players: 2 or 4 **For students:** Grades 4-9

Time: 20-30 mins

Learning intent(s): Be able to work backward to find the dimensions of a rectangle after being given the area or perimeter.

EQUIPMENT

- Blank 20x20 grid
- A ten-sided dice
- One square tile marked with 'P' on one side and 'A' on the other
- A different coloured whiteboard marker for each player

AIM

For your rectangles to cover the greatest area at the end of the game.

STARTING THE GAME

Each player chooses a corner to start the game from. The first rectangle players place must touch their corner.

The game begins with the first player rolling both the ten-sided dice and the tile marked with 'A' (area) and 'P' (perimeter). Whatever is rolled on the dice is doubled and the letter on the tile tells players whether this number represents the area or perimeter of the rectangle they are about to create.

- Example 1) The dice lands on "8" and the tile lands on "A".
This means all players must create a rectangle with an **area of 16** for that round.
- Example 2) The dice lands on "5" and the tile lands on "P".
This means all players must create a rectangle with a **perimeter of 10** for that round.

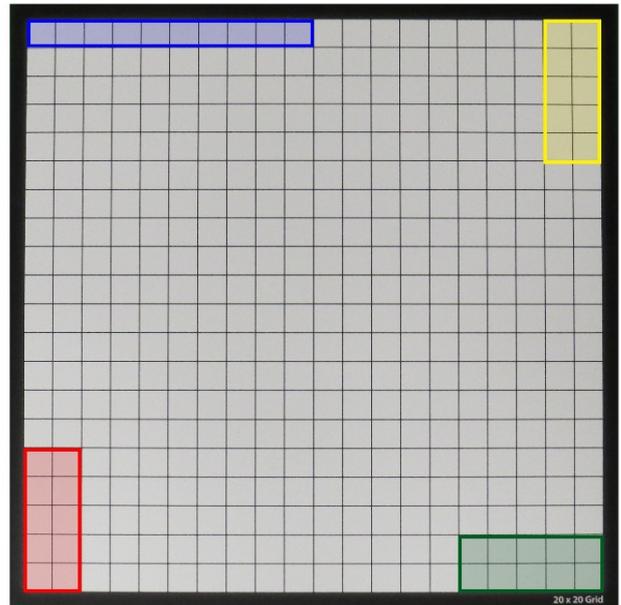
Diagram 1 at the top of the page shows each player placing a rectangle with an area of 10 on the board. Not all rectangles will look the same but they must all meet the criteria given by the dice.

CRITERIA FOR PLACING RECTANGLES ON THE BOARD

To place a rectangle on the board a player must satisfy the following three criteria:

1. The rectangle must equal the area or perimeter given by the dice.
2. A player's rectangle must touch either on the edge or corner of any of their previous shapes.
3. A player's rectangle cannot overlap with any other shape that has already been placed.

Diagram 1: The first rectangle placed in the corner



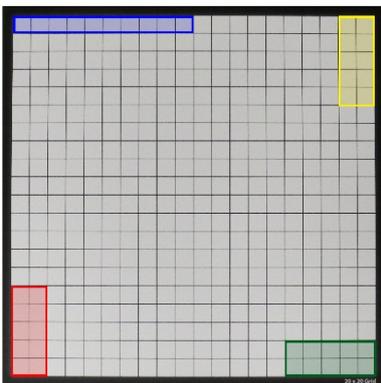
PLAYING THE GAME

Once the dice has been rolled, players take turns drawing in rectangles starting with the player who rolled the dice, then moving in a clockwise direction until all players have had a turn. Once all players have had a turn the round ends and the dice and tile move to the next player and the process repeats.

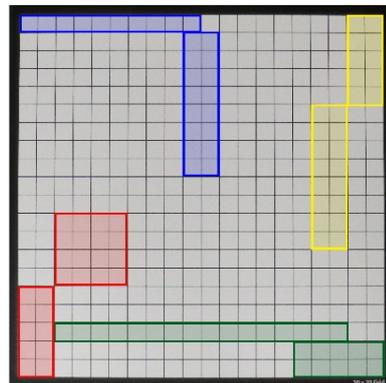
Having one person roll dice on behalf of all the players means that if anyone rolls a bad number, everyone has to deal with it. This makes the game more about skill than luck.

EXAMPLE GAMEPLAY (First four rounds)

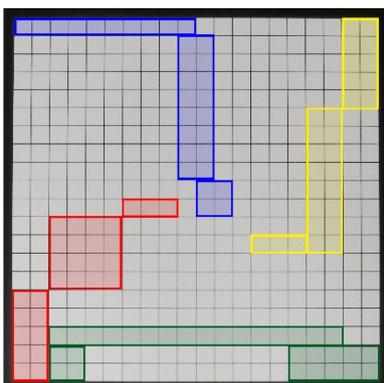
Round 1: The game begins with Red rolling a "5" and an "A". All players must create a rectangle with an area of 10 square units, starting with Red and then going clockwise.



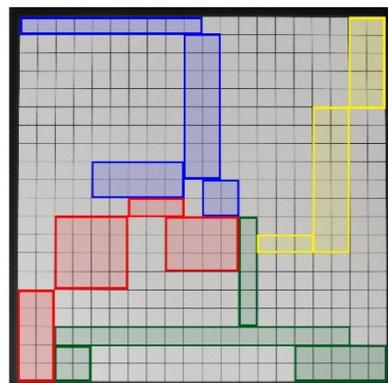
Round 2: The round begins with Blue rolling a "8" and an "A". All players must create a rectangle with an area of 16 square units, starting with Blue and then going clockwise.



Round 3: The round begins with Yellow rolling a "4" and a "P". All players must create a rectangle with a perimeter of 8 units, starting with Yellow and then going clockwise. The green player has used their turn to block Red. Now only the green player can place shapes in the squares at the bottom of the grid.



Round 4: The round begins with Green rolling a "7" and a "P". All players must create a rectangle with a perimeter of 14 units, starting with Green and then going clockwise. Green has created a rectangle with a very small area in the hope of escaping. The yellow player is yet to go this round. What would you do?



SPECIAL CONDITIONS

There are two special conditions where a player must re-roll the dice.

- If a player rolls a 10 for the first turn of the game.
- If a player rolls both a "1" and "P" at any time during the game

KEEPING TRACK OF SCORES

To keep from making mistakes at the end of the game, it's suggested players keep a running total of their area during each round. They may even keep a running total of their opponents scores so they can see who the best person to block is.

Round	Rectangle area (Square units)	Running Total
1	$10u^2$	$10u^2$
2	$16u^2$	$26u^2$
3	$4u^2$	$30u^2$
4	$12u^2$	$42u^2$

A player's running totals may be kept secret.

MISSING A TURN

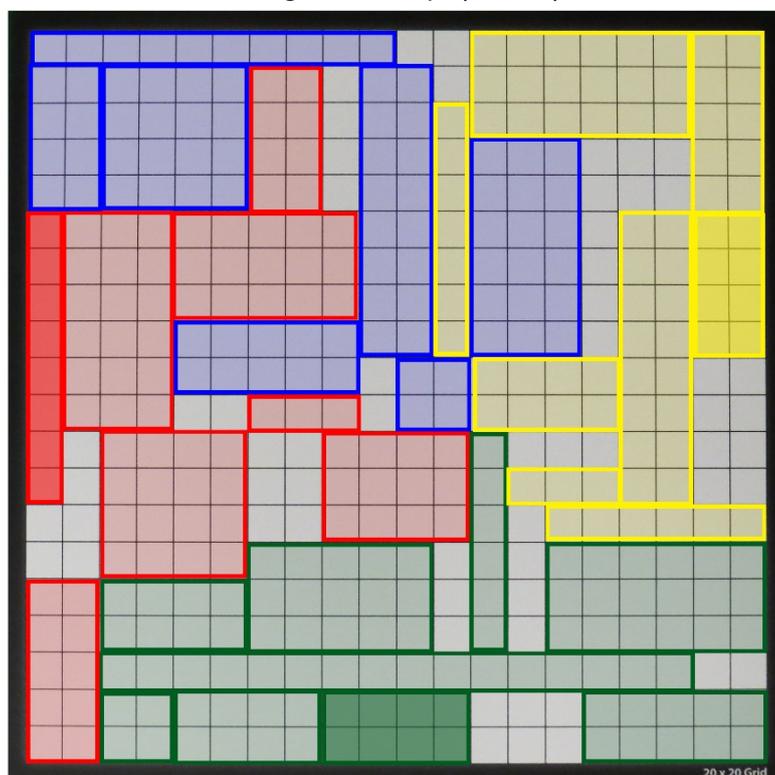
As space becomes limited on the board, players may find they cannot fit in a rectangle when it comes around to their turn. If this happens, any player who cannot fit a shape in the grid misses their turn for that round.

In the diagram to the right yellow has begun the round by rolling a "4" and "A".

Each player must place a rectangle with an area of 8 square units into the grid. The yellow, green and red players have done this (shaded darker) but the biggest shape the blue player can fit in is a rectangle of 6 square units.

Blue has to miss this turn but may join in next round if they can.

Near the end of the game some players may miss their turn



ENDING THE GAME

The game ends when no player can fit in a rectangle during a round. If, on the next turn players had to place a shape with a perimeter of 14 units, nobody could do this and the game would end.

SCORING

Once the game has ended, players add up the total area covered by their rectangles. The player with the highest total area wins the game.

GAME VARIATIONS (ADVANCED PLAY)

Any time the tile lands on 'A' (area) players may place triangles on the board instead of rectangles.

- Triangles may only connect with other shapes at their corners.

CHALLENGE QUESTIONS

- 1) The first roll of the game instructs players to create a rectangle with a perimeter of 18 units. What is the best shape to put in and why? Think about the aim of the game before answering.
- 2) Draw an example of when your shape from question one won't be the best shape to use.
- 3) Why is there a rule against rolling a "10" on the first turn?
- 4) Do you think it's best to try and fence off an area for yourself or to spread out as far as you can? Which of those strategies do you use most often and why?
- 5) How many different rectangles can you create with a perimeter of 18 units?
- 6) Why does this game use a ten-sided dice and doubles each value instead of just using a 20-sided dice? It's not because 10-sided dice are cheaper!!

CHALLENGE ACTIVITIES

- 1) Play a two or four player game where one team always uses the **area** for each turn and the other always uses the **perimeter**. For this game, rolling a one counts as 11 (doubles to 22)

Before you play who do you think will win and why?

- 2) Play a 2v2 game by teaming up with the person next to you. Each player still acts individually but the goal is for your team to gain the highest area at the end of the game.

Did this change the way you played the game? If so, how?

- 3) **Compete v Collaborate:** Play a four-player game but before you start half the players must choose to compete, blocking off their area and protecting their space at all costs. The other two players will collaborate and spread out across the board, even if that means letting their opponents into space they would rather have for themselves.

Which players did better?